Standard Operating Procedure
Indoor Air Contamination

Draft External Version

Note:
Following the discussion at the March 27, 2008 Waste Site Cleanup Advisory Committee meeting, MassDEP has decided to release the internal SOP "as is", without removing DEP-specific procedural detail. The SOP is now available for download at
http://www.mass.gov/dep/public/committee/sac308.htm

Purpose of the SOP

- emphasize the importance of indoor-air contamination problems;
- articulate clear operational issues and communications needs; and
- provide MassDEP program staff, LSPs and the regulated community with technical information and guidelines, procedural recommendations, and practical *Rules of Thumb* to enable them to better understand, recognize, prioritize, and respond to indoor air contamination events.

Sections of the SOP

- A “bottom line” articulation of expectations on looking for, assessing, remediating, and managing/communicating vapor intrusion situations;
- Technical concepts, guidelines, procedures, and recommendations on investigating and addressing vapor intrusion pathways;
- Look-up Tables for Indoor Air Contaminants; and
- A “Toolbox” of practical forms, procedures, guidelines, data, and informational resources.

Operational Prioritization & Expectations

- Why this is a Priority
- Purpose and Application of this SOP
- Overall Approach and Process
- Conceptual Site Model
- Conceptual Site Model
- Determining Whether a Vapor Intrusion Pathway is Present
- Lines of Evidence
- Soil Gas Investigations
- Air Testing Parameters and Methods
- Mitigating Risks from Vapor Infiltration Pathway
- Ongoing Commercial/Industrial Operations

Tables

Residential/School Criteria

Table 1	Indoor Air Concentration Look-up Table Residential/School Criteria

USE MASSDEP "SHORT FORMS" FOR MOST UP-TO-DATE RISK CALCULATIONS AND FOR MULTIPLE CONTAMINANTS

Contaminant	MCP No Significant Risk[1]				MCP Imminent Hazard[2]		Upper Percentile Value of typical indoor air conc[3]		Convert Factor[8] µg/m³ ppbV
	HI = 0.2		ELCR = 1 x 10^{-6}						
	µg/m³	ppbv	µg/ m³	ppbv	µg/m³	ppbv	µg/m³	ppbv	
ACETONE	160	67			8000	3400			2.37
ALDRIN (pesticide)	0.02	0.001	3 EE-4	3 EE-5	0.03	0.002			14.93
BENZENE	6.0	1.8	0.3	0.1	21	6.6			3.19
BIPHENYL, 1,1-	0.4	0.1			20	3.2			6.3
BIS(2-CHLOROETHYL)ETHER			0.007	0.001	0.4	0.1			5.85
BIS(2-CHLOROISOPROPYL)ETHER	28	4.0	0.2	0.03	14	2.0			6.99
BROMODICHLOROMETHANE	14	2.0	0.1	0.02	7.9	1.1			6.71
BROMOFORM	14	1.4	2.1	0.2	130	13			10.35

Commercial/Industrial Criteria

Table 2	Indoor Air Concentration Look-up Table Commercial/Industrial Criteria				
Contaminant	Commercial Office & Retail Imminent Hazard[1]		Occupational Exposure Concentration Limits 8 hours/day (Lower of OSHA PEL or NIOSH REL)[2]		Convert Factor[3] µg/m³ ppbV
	µg/m³	ppbv	µg/m³	ppbv	
ACETONE	27,000	11,000	590,000	250,000	2.37
ALDRIN (pesticide)	0.1	0.01	300	20	14.93
BENZENE	71	22	320	100	3.19
BIPHENYL, 1,1-	68	11	1300	200	6.3
BIS(2-CHLOROETHYL)ETHER	1.4	0.2	29,000	5000	5.85
BIS(2-CHLOROISOPROPYL)ETHER	48	6.8	NL	NL	6.99
BROMODICHLOROMETHANE	27	3.7	NL	NL	6.71
	440	43	5200	500	

General Properties

Table 3	Indoor Air Concentration Look-up Table General Properties				NOTE UNITS!			
Contaminant	Vapor Density[1]	Sat Vapor Conc @ 70°F[2]	50% Odor Recog Threshold[3]	Odor Description	Explosivity Concern[4]		PID Meter[5]	
					Flash Point °F	LEL %	IP	CF @ 10.6 eV
	Air = 1	ppmV	ppmV					
DICHLOROETHYLENE, CIS-1,2-	3.34	227,000	NA	Slightly acrid, chloroform-like odor	36	9.7	9.65	0.80
DICHLOROETHYLENE, TRANS-1,2-	3.34	375,000	8.5	Slightly acrid, chloroform-like odor	43	9.7	9.65	0.45
DICHLOROMETHANE (MeCl)	2.93	493,000	78	Sweet, ether-like odor	NA	NA	NA	NL
DICHLOROPHENOL, 2,4-	5.62	NA	0.1	Medicinal odor	NA	NA	NA	NL
DICHLOROPROPANE, 1,2-	3.9	56,000	0.13	Sweet odor	60	3.4	10.87	NL
DICHLOROPROPENE, 1,3-	3.83	NA	0.5	Irritating sharp, sweet chloroform-like odor	95	5.3	NA	0.96
DIELDRIN	13.2	NA	NA	Mild chemical odor (like insecticide)	NA	NA	NA	NL

Sampling Form

MassDEP	Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup	RTN:
		Town:
BWSC	INDOOR AIR EVALUATION/SAMPLING FORM	Staff:

Address:	Name/Identifier:

BUILDING INFORMATION (check all that apply)	
Type	☐ Residential ☐ School/Daycare ☐ Commercial ☐ Industrial ☐ Mixed ☐ Other
Foundation Type	☐ Full ☐ Finished ☐ Partial Basement/Crawl Space ☐ Slab-on-Grade
Foundation Material(s):	☐ Fieldstone ☐ Concrete Block ☐ Poured Concrete ☐ Other:
Foundation Integrity:	☐ No Cracks/Open Joints ☐ Moderate Cracks/Open Joints ☐ Many Cracks/Open Joints
Basement/Slab Floor:	☐ Concrete/Good Integrity ☐ Concrete with Cracks ☐ Earthen Floor ☐ Carpet/Flooring
Basement Use:	☐ Storage/Infrequent Use ☐ Recreation/Living Space ☐ Bedrooms ☐ Other:
Drainage Sump	☐ No ☐ Yes Standing Water in Sump? ☐ No ☐ Yes Product in Sump? ☐ No ☐ Yes
HVAC	☐ Steam/Hot Water ☐ Ducted HVAC System - HVAC Air Intake in Basement? ☐ No ☐ Yes
Odors?	☐ No ☐ Yes:
USE/STORAGE OF OIL OR HAZARDOUS MATERIALS	
Oil Tank	☐ None Observed ☐ Basement ☐ Attached Garage ☐ Other:

Monitoring Approaches & Techniques

Table 2-1: Summary of General Air Monitoring Approaches & Techniques

	Instrument/Method	Positive Features	Negative Features
Analytical Screening Methods	Photo-ionization Detectors (PID) Flame Ionization Detectors (FID)	☛ On-site detection and quantification ☛ Indication of Imminent Hazard/Evacuation conditions ☛ Identification of vapor entry points	• Low sensitivity • Low specificity • Interferences (e.g. humidity for PID)
Analytical Screening Methods	Portable Gas Chromatograph	☛ On-site detection and quantification ☛ Allows use of simple collection device such as a Tedlar bag, syringe, or even VOA vial	• Concerns over skills of operator and QA/QC • Cannot provide positive identification
n Methods	Evacuated canisters (e.g. SUMMA) Typically 1 L or 6 L	☛ Capability of taking multiple aliquots for analysis ☛ Ease of Use	• More expensive than adsorbent tube method • Low recoveries for heavy organics
n Methods	Adsorbent media tubes	Less expensive than evacuated canister method	• Breakthrough problems • May require special handling to prevent sample deterioration

Installation and Sampling of Soil Gas Probes

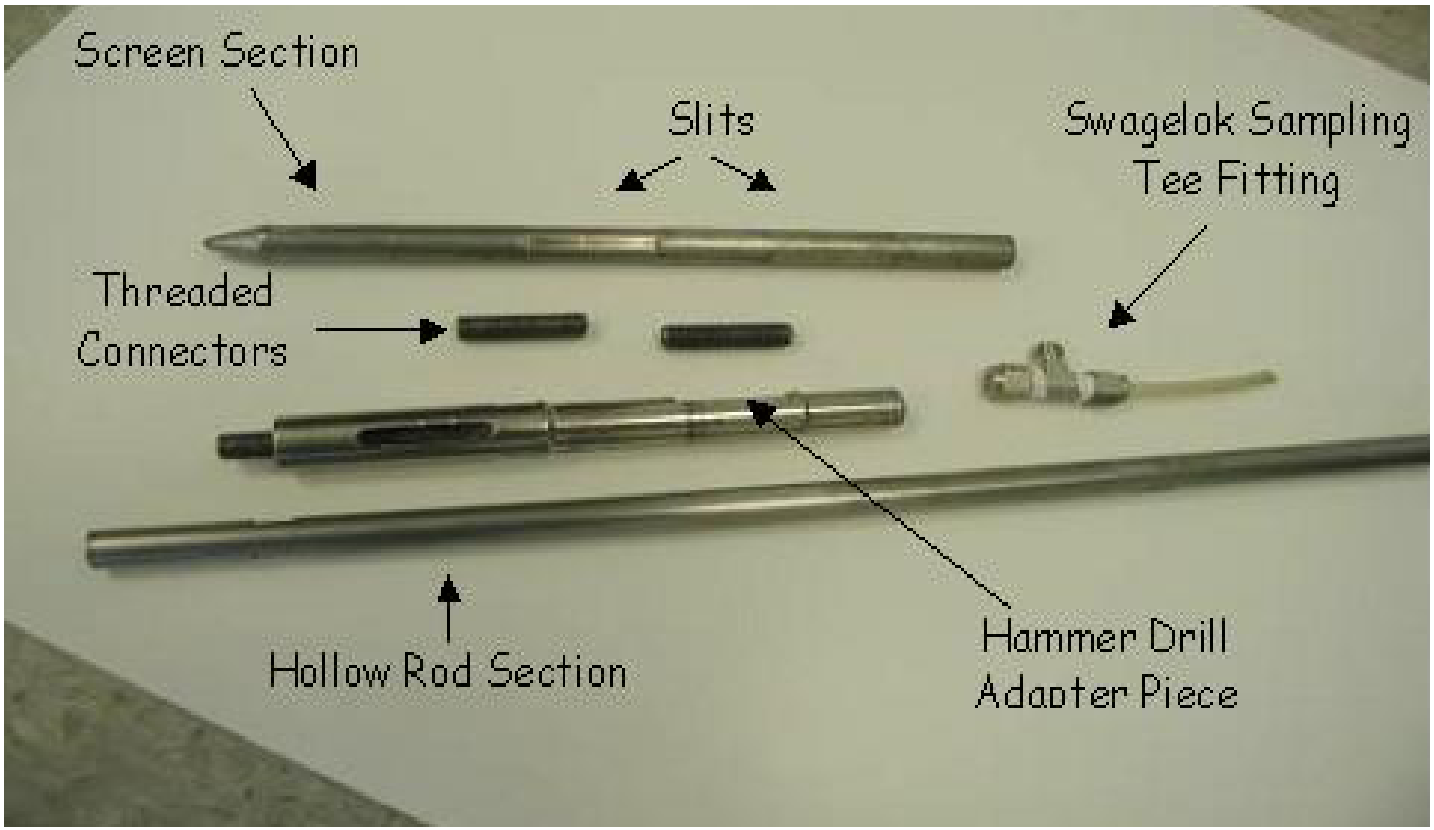

Figure 2-1 – Kerfoot Technologies Inc. “ Macho System”

Design, Installation, Operation, and Monitoring of Sub Slab Depressurization Systems

Figure 4-1: SSD System

Figure 4-4: Fan in Attic